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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/520,366	01/06/2005	Manfred Danziger	0306670-US	5933

7590 08/24/2006

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EXAMINER	
DAHIMENE, MAHMOUD	
ART UNIT	**PAPER NUMBER**
1765	

DATE MAILED: 08/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/520,366	DANZIGER, MANFRED	
	Examiner	Art Unit	
	Mahmoud Dahimene	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 January 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *11-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *11-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 16 is objected to because of the following informalities: Claim 16 is dependent on claim 5, which was canceled. Fractal dimension is defined as "D of 2<d<3", either D or d is not well defined in the claim. Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Regarding claims 11, 12, 13, 17, 18, the expression "i.e." renders the claims indefinite because it is unclear whether the limitation(s) following the expression are part of the claimed invention. See MPEP § 2173.05(d).

4. A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required

feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, claim 12 recites the broad recitation A≥ 3, and the claim also recites A≈4 which is the narrower statement of the range/limitation.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 11-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gliem et al. (US 4,364,792) in view of Hatakeyama et al. (US 6,015,976).

Regarding claim 11, 13, 14, Gliem Describes a process for roughening a surface (possibly of a carrier material), near the surface (column 2, line 11), for improved adhesion by exposing the region of the surface to be coated before the etching process to a heavy ion irradiation (column 1, line 60). "Through this there is produced in the molecules near the surface changes which in a subsequent etching process lead to the formation of exactly defined depressions (cavities) in the surface according to the side, shape and number. By means of this defined surface roughening the adhesiveness of the layers to be metallized is substantially improved. The number, the size and the shape of the depression can be regulated through the choice of the heavy ion radiation,

the duration, the intensity (influx) and the angle of incidence of the radiation and by the subsequent etching process" (column 7, line 60).

"As energy rich radiation there is advantageously used a heavy ion radiation with particles having a mass of greater than 10 and whose energy is greater than 0.1 meV per nucleon. The duration of irradiation thereby can vary between seconds and hours depending on the type of the radiation and the desired "aperture number". The number of heavy ions per unit of surface is decisive in this case" (column 2, line 37).

It is noted that Gliem is silent about heavy ion irradiation being carried out such that the influx of a bundle of rays of high-energy heavy onto a substrate surface (2) takes place under at least two different angles, the trajectories of the intersections are generated each of which connects two recesses with each other to an united volume unit and the intersections of which are to be found in areas of the recesses in the interior of the substrate, and that the result of the subsequent etching process is recesses of an aspect ration A, i.e. the ratio of the length relative to the average radial extent of the recesses (4), from $A \geq 3$, if possible $A = 4$.

The reference of Hatakeyama et al. teaches an apparatus and method for fabrication employing energy beams including ion beams. Hatakeyama teaches irradiation being carried out such that the influx of a bundle of rays of high-energy heavy onto a substrate surface (2) takes place under at least two different angles (figure 73) (forming frusto-conical shapes when mask openings are large enough to produce intersection of the radiating beams), the trajectories can easily be controlled to result in intersections which are generated each of which connects two recesses with each other

to an united volume unit and the intersections of which are to be found in areas of the recesses in the interior of the substrate, and that the result of the subsequent etching process is recesses of an aspect ration A, i.e. the ratio of the length relative to the average radial extent of the recesses (4), from A ≥ 3 (as shown in figure 73). It is noted that in the method of Hatakeyama the etching is performed by the energetic beam, however, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Gliem to include the etch feature defining method of Hatakeyama because Hatakeyama teaches how ion beam angle, energy, flux and duration can be used along with masking techniques to obtain practically any shaped features on a substrate. One of ordinary skill in the art would have been motivated to modify the method of Gliem with the etch feature defining method of Hatakeyama in order to further define the roughened surface with localized cavities in order to further improve adhesion by allowing the adhesive to be "anchored" in the etched micro-cavities.

As to claim 12, Gliem discloses "Moreover, a slanting radiation direction (from a different direction) is particularly advantageous. In this way there are produced a slanting depression reaching into the surface which increase the adhesion of the metal layer by means of the so-called "zipper effect". Preferably the process of the invention is used for the copper plating of polyimide films, polycarbonates, polyester films and epoxide resin films and sheets" (column 2, lines 22-37), suggesting sheets or foils and different radiation impingements .

It is noted that Gliem is silent about collimation and blocking (or masking) of the ion beam, repeated passes, and specific bombardment angles.

Hatakeyama teaches collimation and masking as well as specific bombardment angles.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Gliem to include the teachings of Hatakeyama about collimation and masking as well as specific bombardment angles because the teachings of Hatakeyama improve the micro-cavities formation to enhance the "zipper effect". One of ordinary skill in the art would have been motivated to use more advanced micromachining methods in order to improve upon the adhesion characteristics of Gliem.

As to claims 15, 16, Gliem discloses surface roughness (a surface-depth-relief) as a result of the radiation/etch process citing surface roughness improves anchoring (adhesion).

It is noted that Gliem is silent about the carrier foil has a fractal structure. Howevere, it would appear that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Gliem to include processing of a substrate with a fractal structure because as long as the radiation and etch steps are effective in selectively removing the exposed areas, any material structure, including fractal structures with fractal dimension D of $2<d<3$ will be processed as described above.

Claim Rejections - 35 USC § 103

7. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gliem et al. (US 4,364,792) in view of Hatakeyama et al. (US 6,015,976)as applied to claims 11-16 above, and further in view of Aston (US 4,447,773).

As to claim 17, it is noted that Gliem is silent about ion accelerator or deceleration module.

Hatakeyama teaches "Another aspect of the invention is that the energy beam includes a fast atomic beam, an ion beam, an electron beam, a laser beam, a radiation beam, an X-ray beam, an atomic beam and a molecular beam, i.e., an electrically accelerated energy beam. Combined with pretreatment to generate an energy beam of good linearity and directionality, fabrication can be made selectively, and a fine-structure can be accurately produced according to the fine pattern in accordance with the position and the movement speed of the mask member. By using an energy beam of high directionality, beam energy can be transmitted to even narrow regions of the fabrication surface so that a fine-structure having a high aspect ratio, which is difficult to produce with plasma processing, can be produced." (column 3, line 57).

It is noted that Hatakeyama is silent about a deceleration module.

Aston describes an ion accelerator module used for material processing, the module includes an ion decelerator plate, which is positioned between the accelerator and the workpiece or mask (column 4, line 4).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Gliem to include, in the system for processing carrier material with heavy ions, a linear ion accelerator with a deceleration plate because Aston teaches electrostatic (linear) ion accelerators with deceleration plates are conventionally used in material processing. One of ordinary skill in the art would have been motivated to use an ion accelerator with a decelerator plate in order to control the collimation, energy and flux of the bombarding ions when needed at will.

Claim Rejections - 35 USC § 103

8. Claims 18, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gliem et al. (US 4,364,792) in view of Hatakeyama et al. (US 6,015,976) and Aston (US 4,447,773) as applied to claims 18 above, and further in view of Koh et al. (US 2002/0014597) and Clements (US 5,449,917).

The limitations of ion beam processing, accelerator, decelerator and foils have been discussed above.

It is noted that Gliem is silent about a roller system for processing a foil or film.

The reference of Koh teach that methods of positioning rollers in a vacuum system in order to accomplish desired exposure of a film or foil to energetic ion beams are conventionally used in film processing (figure 5).

Clements teaches a roller-driven multi-pass system for processing a film with an energetic beam.

It is noted that neither Koh or Clements teach the exact system as described by applicant's claim 18, however, the combined teachings of Koh and Clements describe that proper positioning of rollers can expose a film to ion radiation in any desired manner.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Gliem to include, in the system for processing carrier material with heavy ions, a roller system as described in applicant's claims 18, 19, because positioning rollers in vacuum for film surface processing is conventionally known in the art of film surface processing, as suggested by Koh and Clements. One of ordinary skill in the art would have been motivated to use a mask to protect parts of the system that do not need to be exposed, and rollers to expose the film under desired angle or angles in order to achieve at least the dual angle exposure recommended by Gliem and Hatakeyama using one single ion source, and at least a dual-pass system as suggested by Clements.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mahmoud Dahimene whose telephone number is (571) 272-2410. The examiner can normally be reached on week days from 8:00 AM. to 5:00 PM..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mahmood/.
MD.

/NADINE NORTON/
SUPERVISORY PATENT EXAMINER
ART UNIT 1765